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Structural Reforms and Growth

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Publication date:
2006

[Link to publication in Tilburg University Research Portal](#)

Citation for published version (APA):

Eijffinger, S. C. W., & Rossi, A. (2006). *Structural Reforms and Growth: Product and Labor Market Deregulations*. (CentER Discussion Paper; Vol. 2006-112). Macroeconomics.

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No. 2006–112

**STRUCTURAL REFORMS AND GROWTH: PRODUCT AND
LABOR MARKET DEREGULATIONS**

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November 2006

ISSN 0924-7815

Title

Structural Reforms and Growth: Product and Labor Market Deregulations

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Abstract

Structural Reforms and Growth: Product and Labor Market Deregulations

The paper focuses on labor and product market deregulations, as fundamental elements in the passage from an investment to an innovation-based economy. The approach undertaken is prominently empirical. After a very brief description of the regulatory levels on the two sides of the Atlantic, we take two cornerstone theoretical models: one developed by Robert Gordon (1997), the other developed by Blanchard and Giavazzi (2003) and we observe how well their theoretical predictions are supported by hard data. We conclude with an independent study on the accuracy of the IMD competitiveness index in predicting the overall economic performance of countries close to the technological frontier.

JEL: E24, D24, L16,J50

Keywords: employment, unemployment, wages, growth, regulation, productivity, IMD Competitiveness index.

1 Introduction

Economic growth has always been at the center of any medium and long-run economic model. Unfortunately most of the factors driving it were assumed to be out of policymakers' control: demographic growth, natural endowments, capital accumulation and other exogenous forces. Since the beginning of the twenty-first century, on the other hand, more and more attention has been paid to the effect of political institutions on long-run growth. Many authors led by Abramovits operated refinements of the basic catching up hypothesis claiming that backwardness "is not usually a mere accident". Barriers in goods, capital and labor markets as well as inefficiencies at the institutional level were identified as possible obstacles to economic growth. Also Education and Human Capital were attributed an important role. Following Kazushi Ohkawa and Henry Rosovsky,¹ Abramovitz embraced all the barriers to change in society under the categorization of "social capability". The lower the "barriers to change", the higher the level of "social capability" and, consequently, "economic growth" potentials.

Notwithstanding the many correct intuitions, early growth theorists had serious problems in the quantification and qualification of the so-called "social capability" for diverse reasons. Particularly hard to overcome was the endogeneity problem, which can be here synthesized as follows. "The more an economy is advanced, the more it has been subject to changes in the past. Changes are facilitated by a well developed "social capability", but the reverse can be claimed to be true as well". Endogeneity inevitably affected a correct empirical estimation of the theoretical models. It impeded a correct understanding of growth dynamics and the formulation of effective economic policies.

It was not until the beginning of the nineties that, thanks to conspicuous theoretical and empirical contributions of illustrious scholars of the caliber of Daron Acemoglu, Philippe Aghion and Olivier Blanchard (to name a few), we were able to shed some light on the main drivers of structural economic growth.

A thorough understanding of the topic has invaluable potentials not only from a strictly academic point of view, but mainly from a policymaking one.

1.1 What are the Ultimate Drivers of Economic Growth?

A common characteristic of modern frameworks is that they identify a non-constant relationship between growth and its drivers: according to the different developmental stages, different factors are responsible for maintaining a high and sustainable level of growth. All the theoretical and empirical frameworks recognize that structural growth is strictly associated to Total Factor Productivity growth. As Aghion and Howitt (2004)² argue, TFP increases with the number and size of innovations introduced in the market.

The implication is that, ultimately, economic growth rests on two pillars:

- The stock of skilled human capital, which guarantees an innovative and effective research output.

¹ Please refer to Kazushi Ohkawa and Henry Rosovsky, 1973. "Japanese Economic Growth: Trend Acceleration in the Twentieth Century," Stanford University Press.

² For a more detailed analysis, please refer to Aghion, Philippe and Peter Howitt, 2004. "Growth with Quality- Improving Innovations: An Integrated Framework," Harvard University Working Paper

- A set of economic and political institutions that create the appropriate incentives for the agents to innovate and introduce the new technologies in the market.

1.1.1 Education, Human Capital and Innovation: A Simple Model

As far as the first pillar is concerned, the model presented by Aghion et al.³ (2004) can be considered one of the greatest recent contributions in the field. It is particularly relevant here as it helps in explaining the evolution of GDP per capita differentials between EU and US in the last 50 years. An analytical description of the model is out of the scope of the paper. For our purpose it will be enough to present its main ideas and policy implications.

The model is based on the basic assumption that the source of technological progress is dual. It is the result of the adoption of existing technologies and of pure innovation. While the first is generally defined “imitation”, only the second is considered “innovation” *strictu sensu*. The authors reasonably assume that the two tasks typically require different types of workers. Unskilled human capital will dominate in imitation and skilled workers in innovation. Countries that are very close to the productivity frontier typically specialize in innovation while less developed countries concentrate in imitation only. The countries standing in the middle focus on both activities. Following the basic idea adopted by the Rybczynski theorem in international trade, the authors claim that when the amount of unskilled workers exogenously increase, the amount of unskilled individuals employed in imitation increase proportionally more than those employed in innovation. The consequence is that the marginal productivity of skilled workers in imitation increases more than in innovation; skilled workers naturally move from innovation to imitation and so even more unskilled labor goes to imitation. The final outcome is that the economy experiences an increase in employment for both categories of labor in “imitation” and a decrease in “innovation”. The opposite is the case for an exogenous increase in skilled workers.

The implication of the model is that countries do not need to focus on skilled labor until a certain level of development, because relatively “useless”, while it becomes an absolute necessity after a certain point: i.e. where the domestic economy does not benefit anymore from the catch-up effect. Policymakers should work hard on their human capital in order to change their condition from technological followers to leaders.

Finally, the authors also show that the positive relationship between economic growth and the stock of skilled human capital is stronger the closer the economy is to the world technological frontier.

In the empirical section the authors construct panel dataset covering 19 OECD countries for the time-period 1960-2000. Because of the unavailability of the required data, they are not able to include less-advanced economies in their study. Therefore they are not able to prove empirically the totality of their model. Nevertheless they demonstrate that in advanced economies the potential for catching-up is very limited. Unskilled labor appears to contribute very little to technological growth, while skilled labor is significantly correlated to technological progress and is an important source of

³ The interested reader should refer to Aghion, Philippe, Costas Meghir, Jérôme Vandenbussche, 2005. "Growth, Distance to Frontier and Composition of Human Capital," CEPR Discussion Papers 4860

divergence in OECD economies. The authors obtain this result by regressing Total Factor Productivity against the “proximity” of each country to the technological frontier, the proportion of adults with tertiary education and some control variables like country dummies, time dummies and country-specific-effects. Across different model specifications and definitions of skilled and unskilled human capital, the authors consistently obtain a positive and significant correlation between TFP growth and the interaction effect between proximity and the proportion of adults in tertiary education, signifying that adults with tertiary education are more important for growth in economies closer to the frontier.

1.1.2 Innovation and Market Structure

In Aghion, Acemoglu and Zilibotti⁴ (2002) it is presented a model very similar to the one above. It is built following the same intuition that economies should stimulate growth differently according to their stage of development.

The model relates the effectiveness of R&D to market structure and institutions. The authors claim that backward economies can grow rapidly by investing in, and adopting, already existing technologies: by pursuing what we call an “*investment-based growth strategy*”. This strategy should be kept as the highest priority and should be pursued even if it comes at the expense of market rigidities or a relatively less competitive environment. Post-war experiences of Japan and South Korea are taken as leading examples of this so-called “*investment-based growth strategy*”.

Nevertheless, after reaching high levels of development, economies cannot grow anymore by just relying on other countries’ discoveries. The major source of growth becomes innovation and the economic policy should be tailored accordingly. Competitive markets, by adequately rewarding successful managers and firms as well as a variety of other innovation-type activities, are assumed to be the most powerful source of innovation and policy-makers should spend all their energies in ensuring their proper functioning.

While in “*investment-based growth strategy*” is emphasized the role of long-term relationships between firms and banks, of large firms and of state intervention, “*innovation-based growth*” rests on market-based financing, venture capital, young firms, short-term relationships, less “centralized-investments” and better selection of managers.

The choice between the two strategies resides ultimately in the trade-off between investment and experience, on the one hand, and selection, on the other. The investment-based strategy guarantees the allocation of funds to established (and experienced) firms and managers. At the same time it shelters them from competition, with the result that inefficient and ineffective companies (and managers) are less likely to be driven out of the market. “It involves less selection of successful firms and managers, worse matches between agents and economic activities, and less innovative activity by new entrants”.⁵

While investment and experience effects lead to a faster growth rate in backward economies, the selection effect is stronger the closer to the world technology frontier.

⁴ For a formal exposition, please refer to Acemoglu, Daron, Philippe Aghion and Fabrizio Zilibotti, 2002. “Distance to Frontier, Selection and Economic Growth,” NBER Working Paper No 9066

⁵ Ibidem. Page 3

Under the regime of a benevolent social planner, economic growth could be maximized in every period by the adoption of appropriate institutions and policies, but as soon as we introduce the political equilibrium in the model it becomes clear that switching from one strategy to the other is harder than expected. In fact, investment-based growth enriches existing capitalists. Consequently, given that economic power buys political power, we can expect a fierce and powerful resistance to any policy change by that particular interest group. The most straightforward implication is that state intervention stimulates economic growth for some time, but then the economy may get trapped with “inappropriate institutions” that impede its convergence to the world technology frontier. On the other hand innovation-based economies grow slowly when far from the frontier, but have higher chances of completing the catch-up. In the last 40 years Brazil, Mexico and Peru are typical examples of the first; Singapore and Hong Kong of the second.

1.2 Contributions of the Paper

The present paper focuses on the second of the pillars described above and out of the many economic and political institutions we have decided to focus the attention on labor and product market deregulations. Two are the reasons: first, because we believe it is the most important element in the passage from an investment to an innovation-based economy; secondly, because the two markets are strictly interrelated and analyzing them independently would not allow for a clear understanding of the subject at hand.

The approach undertaken is prominently empirical. After a very brief description of the regulatory levels on the two sides of the Atlantic, we take two cornerstone theoretical models: one developed by Robert Gordon⁶(1997), the other developed by Blanchard and Giavazzi⁷ (2003) and we observe how well their theoretical predictions are supported by hard data. The paper concludes with an independent study on the accuracy of the IMD competitiveness index in predicting the overall economic performance of countries close to the technological frontier.

2 Product and Labor Market Regulation

2.1 Product Market Regulation

Product market regulation is usually referred to as a combination of numerous elements, usually related to the degree of privatization and level of competition in a given economy. Following intuition, the more privatized and the higher the level of competition in a given market, the more it is considered deregulated.

⁶ Please refer to Gordon Robert J., 1997. “Is there a trade-off between unemployment and productivity Growth?,” in D. Snower and G. de la Dehesa, eds, *Unemployment Policy: government Options for the Labor Market*. Cambridge UK: Cambridge University Press.

⁷ For a better understanding of the subject at hand, please refer to Blanchard, Olivier and Francesco Giavazzi, 2003. “Macroeconomic effects of regulation and deregulation in goods and labor markets,” *Quarterly Journal of Economics*, 118(3): 879{909}

The eighties were characterized by wide regulatory divergences across countries. For example, 20-30 per cent of non-agricultural GDP of Europe, Ireland and New Zealand was produced by state-owned enterprises. The same figure for US, Japan and Switzerland oscillated around 1 and 10 per cent. Between 1984 and 1998 most of the Anglo-Saxon countries like New Zealand, UK and Australia went through a very strong process of privatization, while continental Europe, with the exception of Portugal, did not go through such a radical transformation. In the last fifteen years under consideration, the different starting points were still reflected at the end of the period. In fact, most of the Anglo-Saxon countries were already at an “advantage” compared to continental Europe and those that weren’t, like Ireland and New Zealand, managed to deregulate very quickly.

The most recent comprehensive assessment of product market regulation is the one conducted by Nicoletti, Scarpetta⁸ et al. (2000). The authors identify three patterns of product-market regulation. The first group/cluster includes mostly Continental European countries. They are characterized by relatively liberal policies as far as international trade and international investments are concerned, but pursue a more interventionist and restrictive approach regarding state control and barriers to entrepreneurship (also called inward policies). The second group comprises Anglo-Saxon countries that have a more hands-off approach in both in-ward and out-ward oriented policies. Finally the third group is composed of relatively heterogeneous countries. Norway and Greece have very strict regulatory frameworks both inward and outward. Italy is very restrictive at home, but very open to the international markets. The opposite is for Canada.

2.2 Labor Market Regulation

Given that labor is the main input for the production of goods and services, a correct functioning of its market is certainly a key element to be considered by policymakers.

Labor markets are directly and indirectly affected by a large number of regulations. Here we will only consider one aspect of it, i.e. Employment Protection Legislation. The reason is that it is a very good proxy for the overall level of labor markets regulation. Furthermore, it was not possible to obtain studies embracing organically all the aspects that constitute labor market regulations like unemployment benefits, levels of minimum wage etc...

By EPL, it is usually meant restrictions on firing such as severance payments, mandatory notice periods, administrative procedures and delays. According to the EU’s Broad Economic Policy guidelines, Member states are invited to “review employment contract regulations and, where appropriate, related costs, with the aim of promoting more jobs and striking a proper balance between flexibility and security”⁹

Recent studies show that Anglo-Saxon countries like UK, USA, Ireland and Canada have very liberal markets on both temporary and long-term contracts. The markets are very strictly regulated in continental Europe with countries like Italy, Germany and France having very high employment protection legislation levels in both types of contracts.

⁸ For the complete analysis, please refer to Nicoletti, Giuseppe, Stefano Scarpetta, and Olivier Boylaud, 2000. “Summary indicators of product market regulation with an extension to employment protection legislation,” Economics Department Working Paper 226, OECD.

⁹ Council Recommendation. 21st June 2002.

Other countries like Sweden and the Netherlands score very well in temporary and relatively badly in long-term ones.

Almost half of the countries enacted EPL reforms in the 8 year time-span under consideration. Apart from France which increased the overall level of protection, all the other countries worked in the other direction. Greater attention was given to temporary contracts, most likely because of the laxer political constraints compared to the reforms that touch long-term ones. The reason stands in the fact that unions are sustained and financed by the employed workers, which are mainly under permanent working contracts: in order to provide companies for some degree of flexibility in their hiring and laying off schemes, each state had to reform the sectors of the labor market that were less defended by lobbies. Even though not optimal, this approach usually led to some benefits from an efficiency point of view. On the other hand, countries like Italy, with very strong restrictions on permanent contracts and relatively low on temporary have now a divided labor market: the young workforce is under temporary contracts while the elderly are under very safe employment conditions, with the obvious social tensions that result from it. The hope is that in the future it will be possible to diminish the EPL levels on long-term contracts all over the EU.

2.3 Where do We Stand?

The theoretical models illustrated in the first section of the paper highlight the importance of competitive goods and labor markets for productivity and economic growth in advanced economies. Unfortunately the empirical assessments conducted on both sectors highlight that continental Europe is still behind in the deregulation process compared to its direct rivals US and Japan. The entire set of economic and political institutions established during what Acemoglu and Aghion would define as the “investment period” appear now to be very strong barriers to the needed restructuring process.

The rest of the paper will focus on the empirical estimation of some key relationships entailed by well-known theoretical models between regulation, employment and productivity. In particular, it tries to disprove one widely shared misconception: that higher unemployment may potentially lead to higher productivity growth. It tries to estimate the effects of regulation on overall employment and it concludes with an analysis of the effects of product and labor market regulation on long-run growth. The findings should work at clarifying some ideas within the research community as well as help the policy-makers in working in a sensible direction to increase European competitiveness on the international scene

3 Unemployment and Productivity Trade-Off

In this section we estimate a model from Robert Gordon on the trade-off between unemployment and productivity growth. This proves helpful in the analysis of European and American GDP per capita and productivity growth performance over the past

decades. Europe has shown a large increase in output per hour¹⁰ with respect to the US. Most of the commentators claim it is the result of the stronger product and labor market regulation in the old Continent: the restrictions in place are deemed to increase unemployment with the consequent exclusion of least productive individuals from employment.

Because the final aim of policy-makers is the welfare of the citizens and because the GDP per capita measures are a relatively poor proxy of society's well being, alternative measures have been adopted, like output per hour¹¹. On this regard, many academics believe in the existence of a long-run trade-off between unemployment and productivity. A very important consequence for policymakers is that they might be tempted to accept high unemployment levels with the idea of speeding productivity growth.

The main contribution of Gordon's model is the analysis of the dynamic effects of the so-called "structural shocks", defined as reform attempts in the labor or goods markets. In its theoretical framework, it is shown that there is a trade-off between productivity and employment in the short-run. In the long-run a dynamic path of adjustments involving capital accumulation or de-cumulation leads to the elimination of such trade-off. The bottom line is that deregulation leads to lower unemployment levels, but does not slow down productivity growth. Unfortunately, as described below, the author's empirical findings are relatively disappointing.

In the next section we present an empirical estimation of Gordon's theoretical conclusions and we compare it to the findings he presented in his original paper. The hope is to clarify some of the doubts still present in the current debate.

3.1 An Empirical Analysis of the Relationship between Unemployment and Productivity

3.1.1 Means and Variances of Output per Hour

Gordon¹² tests empirically its model by collecting data regarding growth rates of output per hour and of Multi-factor productivity (or Total Factor Productivity) for the period 1960-1992. Some of the main features of the data are summarized in Figure 1 below. It displays means and variances of output per hour across nine sectors for seven countries. The averages show a productivity slowdown in the period 1973-1979 across all countries, due to the oil shocks of the seventies. Some countries, like Canada, US and Japan managed to recover after the shock and they were able to have a higher productivity growth during 1979-92 than 1973-1979. This was not the case for the four European

¹⁰ For a more in-depth analysis, please refer to Gordon, Robert J., 2004. "Two Centuries of Economic Growth: Europe Chasing the American Frontier," NBER Working Papers 10662, National Bureau of Economic Research, Inc. Page 4

¹¹ For a thorough discussion, please refer Gordon, Robert J., 2004. "Two Centuries of Economic Growth: Europe Chasing the American Frontier," NBER Working Papers 10662, National Bureau of Economic Research, Inc.

¹² Please refer to Gordon Robert J., 1997. "Is there a trade-off between unemployment and productivity Growth?" in D. Snower and G. de la Dehesa, eds, Unemployment Policy: government Options for the Labor Market. Cambridge UK: Cambridge University Press.

countries under consideration that experienced lower productivity growth after 1979 than during 1973-1979. European countries maintained anyways a higher level of productivity growth compared to Canada and US over the eighties. The most common interpretation of these figures is that the prior 1970 catch-up effect was relatively strong. As soon as the various countries got closer to the American technological frontier the productivity growth levels converged as well.

Country	1960-1973	1973-1979	1979-1992
United States	2.15 (3.99)	-0.95 (13.83)	2.01 (3.93)
Canada	3.53 (3.14)	0.77 (10.14)	1.64 (1.17)
Japan	8.47 (5.68)	2.68 (6.14)	3.17 (0.91)
France	4.64 (4.13)	3.68 (2.08)	3.14 (2.86)
Germany	4.97 (2.01)	4.23 (3.18)	2.36 (2.05)
Italy	6.38 (2.05)	1.91 (3.09)	1.87 (3.38)
United Kingdom	4.02 (5.67)	3.32 (23.59)	2.91 (9.27)
Average	4.88 (3.81)	2.23 (9.57)	2.44 (3.37)

Figure 1: Growth Rates of Output per Hour, Mean and Variance by Country.

Source: Gordon Robert J., 1997. "Is there a trade-off between unemployment and productivity Growth?" in D. Snower and G.de la Dehesa, eds, Unemployment Policy: government Options for the Labor Market. Cambridge UK: Cambridge University Press. Page 56

The theoretical analysis presented in Gordon's paper treated an increase in TFP as an exogenous event. As explicitly stated by equation 1.1 reported below,

$$\Delta q - \Delta h = \Delta a + (1 - \alpha)(\Delta k - \Delta h) \quad (3.1)$$

Gordon decomposes the observed growth rate of output per hour between growth of TFP (Δa) and the contribution of the growth in capital per hour $[(1-\alpha)(\Delta k - \Delta h)]$ for the non-farm private business sector. His results are reported in Figure 2 below. The data seem to be consistent with one of the key aspects of Gordon's model, i.e. capital accumulation/de-cumulation. Most of the growth in the output per hour in US and Canada was in fact due to an increase in capital accumulation that increased very rapidly over the period. The exact opposite is true for European countries that after 1979 experienced a large decrease in investments. While output per hour growth in Europe was mainly driven by Total factor Productivity growth, in US it was mainly sustained by the contribution of capital growth.

	Output per Hour			Contribution of Capital			Multi-Factor Productivity		
	1960-1973	1973-1979	1979-1992	1960-1973	1973-1979	1979-1992	1960-1973	1973-1979	1979-1992
United States	1.92	0.46	1.20	0.57	0.60	0.82	1.35	-0.14	0.38
Canada	3.02	1.27	1.41	0.72	0.91	1.45	2.30	0.36	-0.04
Japan	8.23	3.08	3.22	...	1.79	1.59	...	1.29	1.63
France	4.90	3.94	2.55	1.26	1.55	0.98	3.64	2.39	1.57
Germany	5.33	4.38	2.36	1.90	1.69	0.92	3.43	2.69	1.44
Italy	6.71	1.99	1.90	1.15	-0.64	0.19	5.56	2.63	1.71
United Kingdom	3.53	2.20	1.27	1.21	1.04	0.05	2.32	1.16	1.22

Figure 2: Growth Rates of Output per Hour, the Contribution of Capital and Mutli-Factor Productivity

Source: Ibidem. Page 57.

“This supports the emphasis placed [...] on the role of wage-setting shocks in setting into motion a process of capital de-cumulation, while also causing an increase in unemployment”.¹³

3.1.2 Productivity Growth Regressions

The theoretical framework presented predicts that the correlation between change in unemployment and growth rate of productivity can be positive (in the short-run after a wage-setting shock), negative (always in the short-run after an oil shock) and zero (in the long-run). The framework makes only one sure prediction: the negative correlation between the change in unemployment and the change in capital per employee. Gordon tries to observe the aforementioned interrelations through a set of different regression equations. The dependent variables are alternatively growth in output per hour, growth in capital per member of the labor force and growth in MFP. Each variable is measured over the three time intervals reported in figure 1 and 2. The explanatory variables are a set of dummies comprising country effects, sector effects and time effects. Two economic variables are also included:

- The level of productivity of each country with respect to US at the beginning of a particular interval. The sign of such coefficient is expected to be negative, according to the catch-up effect.
- The change in a country's unemployment rate.

Here is the regression equation as presented by the author:

$$(\Delta q - \Delta h)_{ikt} = \alpha_0 + \alpha_1 \Delta U_{kt} + \alpha_2 \frac{(Q/H)_{ikt}}{(Q/H)_{itUS}} + \sum \beta_k DC_k + \sum \gamma_i DS_i + \sum_t DT_t + \varepsilon_{ikt} \quad (3.2)$$

DC= set of country dummies

DS=is a set of sector dummies

DT= set of interval dummies

The regression results are presented in Figure 3. Column one and two differ only in the fact that (1) excludes the “country-sector level effect”. Including it substantially reduces the size of country dummies indicating that the more rapid productivity growth in Europe compared to the US can be attributed to the “convergence effect”.

The exclusion of “unemployment change” from the explanatory variables in column (3) further reduces the size of the country effects, indicating that the high values of country effects in column (1) and (2) offset the negative coefficient of the “change in unemployment” for the European countries.

The coefficient for unemployment change is insignificant both in (1) and (2). Some sectors' coefficients are highly significant, indicating a high variability of growth rates in the different sectors across countries. Finally, time effects are significant only in (3), where “change in unemployment” is excluded from the explanatory variables. For this reason, the author claims that in (1) and (2) “productivity slowdown is spuriously explained by the increase in unemployment”.

¹³ Ibidem. Page 37

In column (4) the dependent variable is “capital per potential hours”, where potential hours are defined as “the hours that would have been worked if a country had the unemployment rate at the beginning of the period rather than at the end of the period”.¹⁴ Productivity with respect to the US enters negatively with the expected coefficient and even the change in unemployment coefficient is significant and with the expected sign (the higher the unemployment, the lower the marginal productivity of capital and the lower capital investments).

	Output per Hour			Capital per Potential Hour	Multifactor Productivity
	(1)	(2)	(3)	(4)	(5)
Constant	2.55**	4.77**	5.12**	4.93**	4.33**
Productivity Level Relative to U.S.	—	-2.45**	-2.48**	-2.63**	-2.36**
Change in Unemployment	-0.46	-0.43	—	-0.56*	—
Canada	1.37*	0.35*	-0.06	0.27*	-0.48
France	3.81**	2.34**	1.35	2.45**	0.68
Germany	3.35**	2.34**	1.68**	2.29**	0.91
Italy	2.48**	2.79**	2.28**	1.97**	2.10**
U.K.	3.53**	2.36**	1.43*	1.78*	0.75
Agriculture	1.53*	0.87	0.86	0.96	-1.74**
Mining	-0.64	-0.68	-0.68	2.28**	-1.63**
Utilities	0.42	0.36	0.36	-0.93	-0.43
Construction	-1.87**	-2.13**	-2.13**	-0.38	-2.07**
Transport/Communication	0.11	0.17	0.16	-1.47	0.56
Trade	-0.11	-0.90	-0.89	-0.30	-1.02
FIRE	-1.99**	-2.13**	-2.14**	-2.77**	-2.16**
Services	-1.76**	-1.30	-1.29	-0.32	-1.67**
1973-1979	-1.41**	-1.12*	-1.65**	0.10	-1.33**
1979-1992	-0.74	-0.23	-1.28**	0.13	-0.82*
R ²	0.34	0.39	0.39	0.43	0.37
S.E.E	2.30	2.20	2.21	2.19	1.90

Figure 3: Regression Equations Explaining Growth Rates by Country and Sector, Three Intervals, 1960-92

Note : * Indicates that coefficient is significant at 5 percent level, ** at 1 percent level

Source: Ibidem. Page 57.

Country specific dummies for the European countries show that part of the higher productivity growth of Europe is due to the higher capital accumulation (holding constant the change in their unemployment rates). Unexpectedly time dummies are not significant: capital accumulation effects are entirely explained by country-sector productivity variables and unemployment changes. Finally, the estimated results for sector specific coefficients are relatively hard to rationalize. Although equation (4) is able to represent the catch-up effect of Europe with respect to US and is also able to explain the slowdown in capital accumulation after an increase in unemployment, there are numerous factors, like the insignificance of time and sector-specific coefficients that leave us relatively partially dissatisfied with the regression results.

¹⁴ Ibidem. Page 40

In column 5 the dependent variable is MFP. Two aspects of this regression outcome are worth being highlighted. Firstly, the only country-specific coefficient is the one for Italy. Secondly, the time-specific dummy coefficients suggest that between 2/3 and 3/4 of the productivity slow-down in column (3) can be attributed to a slowdown in MFP growth and the rest to a slow-down in capital accumulation due to higher unemployment rates.

Gordon's empirical estimations were able to successfully isolate the catch-up effect and the effect of unemployment on capital accumulation. His regression equations were not able to find a significant relationship between unemployment and labor productivity. This is because apart from the numerous wage-setting shocks, the period under consideration was dominated by oil price shocks: while the first mostly create a positive correlation between unemployment and productivity, the latter a negative one. As a result the period under consideration does not allow for the identification of a significant relationship among the two variables at hand. This is the starting point of our independent empirical investigation thoroughly described in the next section.

3.2 Labor Productivity and Unemployment

This section was inspired by the inconclusiveness of Gordon's findings on the relationship between unemployment and labor productivity, which was one of the key elements of his theoretical model. As explained above, the lack of a significant relationship between the two could be attributed to the time-period considered (1960-1992). For this reason we have decided to conduct our research on a different period, i.e. 1981-2004. This period allows us to exclude most of the effects of the oil-shocks that strongly affected Gordon's study. On the other hand, the sample period should be able to represent the effects of the strong-wage setting shocks that occurred during the '70s and '80s in US and EU. As a consequence we would expect a short-run strong positive relationship between unemployment and labor productivity. This significant positive relationship is expected to nullify in the long-run due to a slowdown in capital accumulation.

3.2.1 The Data

Following Gordon's Model, we focused on two variables: the "Change in Unemployment" and the "Change in Labor Productivity". The first is the change from year to year in unemployed individuals as a percentage of total labor force. Labor productivity is defined as GDP per hour worked, where GDP for each country refers to its Gross Domestic Product, in national currency, at constant prices, OECD base year 2000. The measures of labor productivity are presented as rates of change as well.

The source of the entire sample is the OECD database. Given the scarce availability of productivity data, only advanced countries were included in the sample: i.e. Australia, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, The Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, United Kingdom and Unites States. This does not entail any significant loss given that the theoretical framework aimed at explaining the differential unemployment and productivity paths between EU and US. Data were collected for the period 1981-2004.

3.2.2 The Model and the Regression

The empirical model to be proposed analyses the statistical relationship between the “Change in Labor Productivity” and the “Change in Unemployment”. As in Gordon’s model, the first is taken as the dependent variable. A panel data model is used. We use country-specific and time-specific fixed effects because the individual effects are correlated with the regressors. When running the regression on the entire sample, we have a total of 391 observations. We have only one model specification and we test it across different time periods as specified below:

$$(\Delta q - \Delta h)_{kt} = \alpha_0 + \alpha_1 \Delta U_{kt} + \sum \beta_k DC_k + \sum_t DT_t + \varepsilon_{kt} \quad (3.3)$$

The results of the regression conducted over the period 1981-2004 are reported below in figure 4.

Country Fixed and Period fixed effects estimations are not reported in the table. The reason is simply that their role is to reduce the amount of spurious correlation between the changes in unemployment and labor productivity. The coefficient for unemployment is positive and significant. Given the relative wide time-span (23 years), we were expecting it to be insignificant in the long-run as predicted by Gordon’s theoretical framework. By reducing the time-span to ten years (1981-1990), the coefficient for “unemployment change” increases its value to 0.459 and maintains its significance at 1% level. By reducing it to six years, the coefficient increases further to 0.599 with no changes in significance.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	2.047612	0.076246	26.85550	0.0000
Unemployment change	0.327083	0.091163	3.587901	0.0004
Effects Specification				
Cross-section fixed (dummy variables)				
Period fixed (dummy variables)				
R-squared	0.304471	F-statistic	3.939794	
Adjusted R-squared	0.227190	Prob(F-statistic)	0.000000	
Durbin-Watson stat	1.698663			

Figure 4: Regression results for the relationship between change in unemployment and productivity per hour. Time and country effects omitted from the table and available on request

This seems to agree with Gordon’s predictions: after the bulk of wage-setting shocks during the seventies and beginning of the eighties, the longer the period into consideration, the lower the effects of changes in unemployment on labor productivity. In principle, if we could have another ten/fifteen years of sample after 2004 without major reforms attempts or economic shocks, we could observe the coefficient for “unemployment change” decrease further and eventually become insignificant. This can

be noticed already if we take the years 1995-2003 as a sample. The coefficient for “unemployment change” is now positive but insignificant: the increase in unemployment during this last time-span was not accompanied by an increase in labor productivity.

3.2.3 Findings and Concluding Remarks

The results of our empirical research seem to be in line with Blanchard’s findings¹⁵, i.e. after 1995 the growth in output per hour (intended as TFP) has strongly decreased in Europe, while it has picked up in US. Some analysts attribute it to the end of the catching-up or convergence effect. This interpretation is certainly true, but another effect worked in the same direction: the slowdown in capital investments in the EU and its increase in US over the last two decades of the twentieth century. This reasoning is confirmed by the fact that capacity utilization has not decreased in Europe over the period at hand meaning that, after strong disinvestments, the current level of capital is not able to fully employ the labor force.

As far as the possible critiques to the present study are concerned, it may be argued that the limited amount of variables utilized could make us suspicious about the soundness of the results obtained. On the other hand, it is relatively hard to find a limited amount of control variables and, in his estimations, Gordon himself mainly relied on time and country effects.

To conclude, the empirical results obtained prove the economic soundness of the theoretical model introduced by Gordon. They also confirm that the time period used in his study was responsible for the failure in proving any significant relationship between changes in unemployment and productivity. The next section is dedicated to the empirical estimation of one key conclusion of Blanchard and Giavazzi’s framework: i.e. product market deregulations affect positively employment¹⁶.

4 Product Market Regulation and Employment

Following the classification and scheme presented by Nicoletti, Scarpetta et al.¹⁷, product market regulation is commonly analyzed among three axes: state control, barriers to entrepreneurship and barriers to trade and investments. The definition of employment rates is “the percentage of employed individuals over total working-age population”. The approach by Nicoletti et al.¹⁸ (2001) and Boeri et al.¹⁹ (2000) has been to draw inferences

¹⁵ Blanchard, Olivier, 2004. “The Economic Future of Europe,” NBER Working Papers 10310, National Bureau of Economic Research, Inc.

¹⁶ For a thorough discussion, please refer to Blanchard, Olivier and Francesco Giavazzi, 2003. “Macroeconomic effects of regulation and deregulation in goods and labor markets,” *Quarterly Journal of Economics*, 118(3): 879{909}.

¹⁷ For further reference, please refer to Nicoletti, Giuseppe, Stefano Scarpetta, and Olivier Boylaud, 2000. “Summary indicators of product market regulation with an extension to employment protection legislation,” *Economics Department Working Paper 226*, OECD.

¹⁸ Nicoletti, Giuseppe, Andrea Bassanini, Ekkehard Ernst, Sébastien Jean, Paulo Santiago and Paul Swa, 2001. “Product and labour markets interactions in OECD countries,” *OECD Economics Department Working Papers 312*, OECD Economics Department.

¹⁹ Boeri, Tito, Giuseppe Nicoletti and Stefano Scarpetta, 2000. “Regulation And Labour Market Performance,” *CEPR Discussion Papers 2420*.

on the relationship at hand via simple bivariate correlations between the employment rate and goods markets regulation at a given point in time: 1998 in Nicoletti et al. (2001) and 1995 in Boeri et al (2000). Both studies focused on the non-agricultural business sector. In Nicoletti et al. the authors also analyze the relationship over time, but they lack clarity in explaining the procedure adopted, claiming only that they use a “time-series index”. Both studies analyze further the relationship through different model specifications and using different sets of control variables, but their approach is not very satisfying as explained below. The present section illustrates their findings and tries to extend them via a panel data study as detailed below.

4.1 Bivariate Correlations’ Findings and other Empirical Results

The employment and labor markets bivariate correlations obtained by the aforementioned authors are reported in figure 5 and 6 A&B. As clearly highlighted by the figures below, the authors obtain almost the same negative relationship between employment rate and product market regulation when using different time periods and data sets.

But through bivariate correlations we are not able to determine if an increase in product market regulation leads to a decrease in employment rate and vice versa. The bivariate correlations, in fact, just tell that countries with high product market regulation are associated with lower employment rates, but there might be no causality between the two variables or, more importantly, another factor may move them in the same direction.

The two studies go on running an empirical investigation on the determinants of employment rate. The aim is to check if product market regulation is significant and with the expected sign once put in a model with other explanatory/control variables.

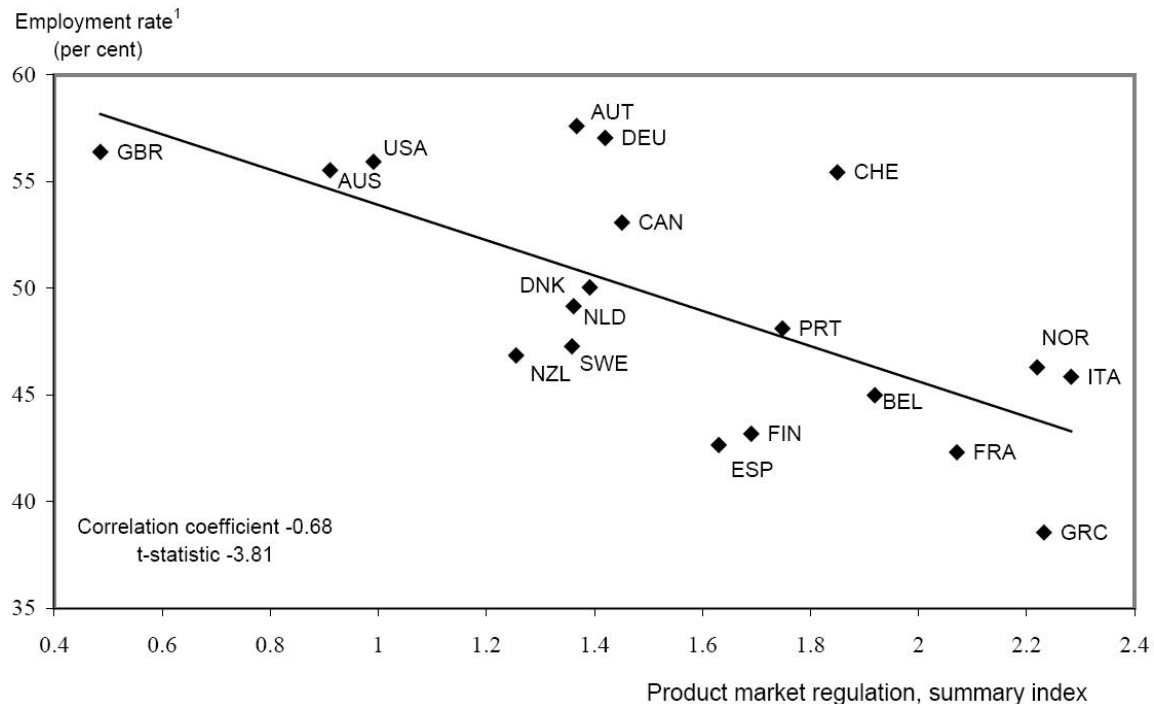


Figure 5: Employment rate in the non-agricultural business sector and regulation, 1995
Source: Boeri, Tito, Giuseppe Nicoletti and Stefano Scarpetta, 2000. "Regulation And Labour Market Performance," CEPR Discussion Papers 2420. Page 24

Boeri et al. (2000) did not dispose of detailed information regarding the evolution of product market regulation over time. For this reason, they decide to conduct a panel data for the period 1982-1995 excluding “product market regulation” from the set of explanatory variables. Apart from the common institutional and non-institutional explanatory variables (i.e. “level of unemployment benefits”, “union density”, “tax wedge” etc...), the authors decide also to include country-specific effects

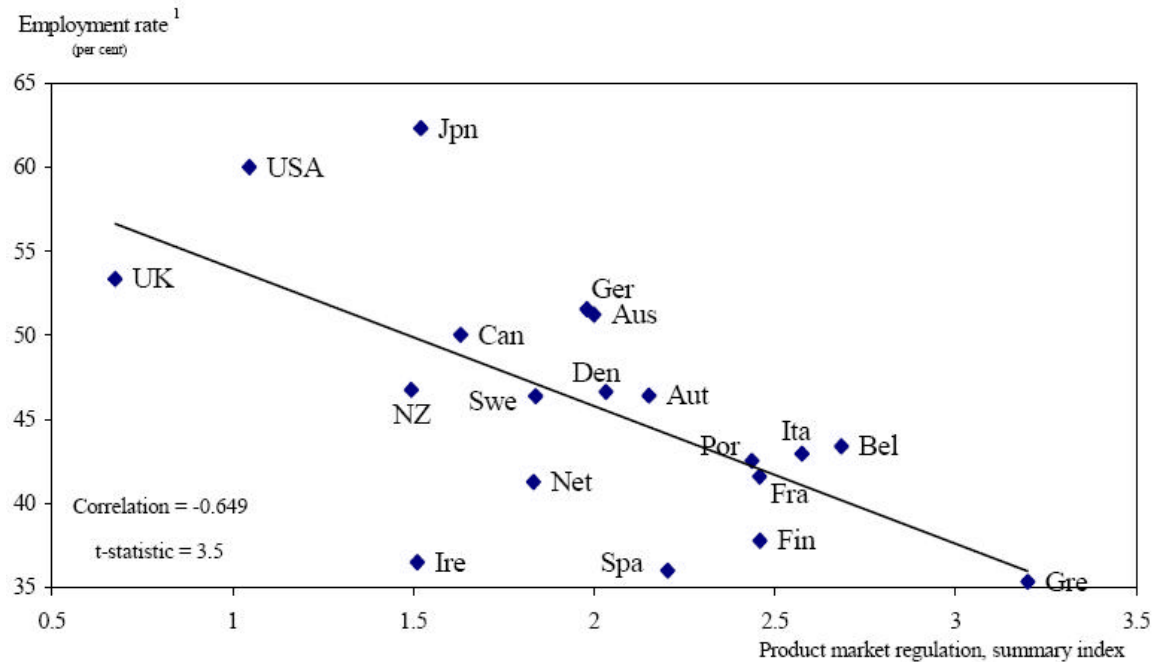


Figure 6 A: Employment rate in the non-agricultural business sector and regulation, 1998

Source: Nicoletti et al., 2001 “Product and Labour Markets Interactions in OECD Countries” Economics Department Working Papers No. 312. Page 47

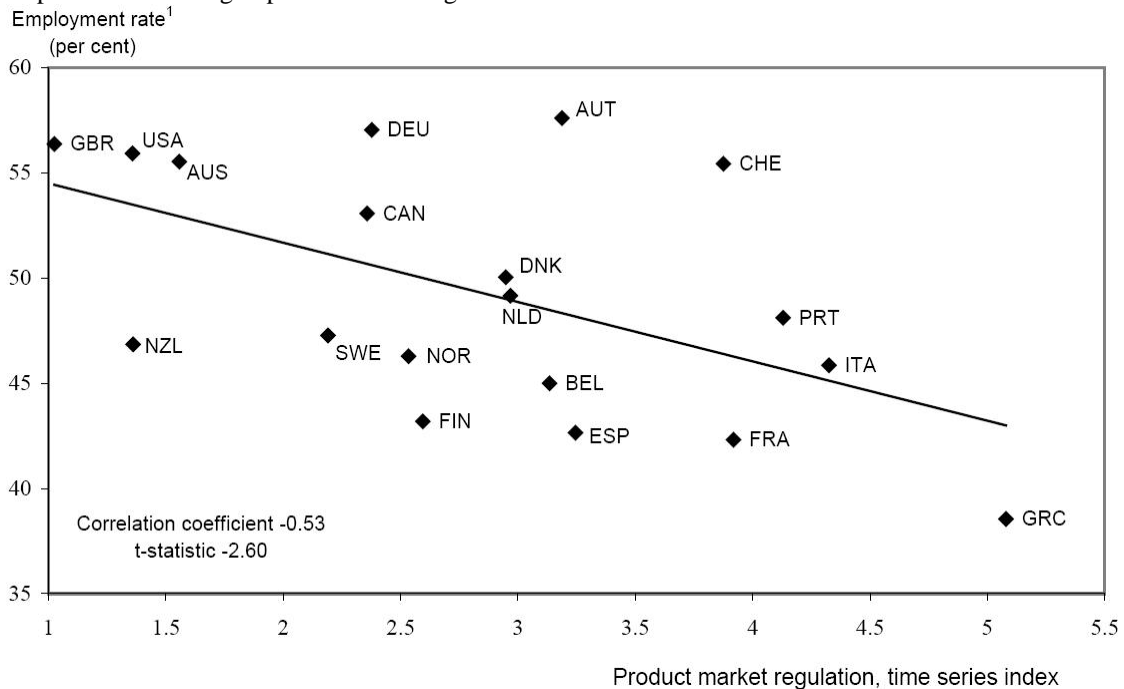


Figure 6 B: Employment rate in the non-agricultural business sector and regulation, Time-Series index

Source: Ibidem. Page 47

Given that fixed effects pick-up the variation not explained by the variables included in the model, the authors regress the country-specific effects against product market regulation (State control, Barriers to Entrepreneurship and Barriers to Trade and Investments). A strong relationship between country-specific effects and product market regulation, in fact, would indirectly prove the relationship between the latter and employment. Unfortunately the results obtained are disappointing. Out of eight explanatory variables embracing different aspects of product market regulation, only two are significant at ten percent level and with the expected sign. The authors claim that the insignificance of the coefficients can be attributed to the fact that there is a very high correlation (multi-collinearity) between product and labor market regulation. Therefore the effect of the first is not present in country-specific effects, because taken away by the latter.

Nicoletti et al. (2001) instead conduct a panel data study using “product market regulation” as one of the explanatory variables. The authors constructed the index for each country through an analysis of seven sample energy and service industries for the period 1970-1998. “Employment rates were related to the economy-wide and time-series indicators of the stringency of product market regulations controlling for a number of other policy and institutional factors that have been identified in the literature as contributing to the equilibrium level of employment”²⁰. Several model specifications were attempted with no qualitative differences in the results. The best model specification is a standard panel data with a time-varying indicator for product market regulation. Reported below in Figure 7 are the results for three versions of the latter specification as well as for two versions of a basic specification (that excludes Product Market Regulation from the regressors). As far as the control variables are concerned, we can see that the coefficients are relatively homogeneous across the different model specifications. Tax wedges and unemployment benefits do not appear to have a decisive impact, while the effect of unionization is consistently strong.

As expected the impact of EPL on employment rates is negative, with the impact being stronger when the state is characterized by an intermediate degree of centralization/co-ordination.

The effect of product market regulation on employment is negative and highly significant. From the table below we can also appreciate the interaction between product market regulation and the other explanatory variables in the model. The coefficient for “EPL” is halved when we include product market regulation to the basic model specification. The coefficient for “tax wedge” instead becomes significant. Finally, product market regulation appears to be less harmful when associated with highly corporatist labor market regimes.

Unluckily the authors do not specify what they exactly mean by “time varying indicator”, and they do not even specify which estimators are used. In the appendix, there is a discussion on the advantages and disadvantages of using OLS or GLS estimators in this type of studies, but it is not clearly stated which estimator is used in which case. Even if not explicitly stated, it seems that all the variables in the model are expressed in nominal values. Time-series data are affected by an autocorrelation of the error term that, if not

²⁰ Nicoletti, Giuseppe, Andrea Bassanini, Ekkehard Ernst, Sébastien Jean, Paulo Santiago and Paul Swa, 2001. “Product and labour markets interactions in OECD countries,” OECD Economics Department Working Papers 312, OECD Economics Department. Page 45

corrected, might result in an overestimation of the significance of the model as well as of the individual coefficients. The authors do not report thoroughly the estimation procedure, and this casts some doubts on the approach as well as on the accuracy of the results. The objective of the next section is to conduct a study similar to the ones just presented, but following a different approach. It allows us to check the robustness of the results obtained by the previous models and gain a clearer understanding of the effects of product market regulation on employment.

Method	Basic specification		Time-varying regulation		
Regressors					
Constant	67.62 ** (43.48)	70.13 ** (40.84)	67.80 ** (33.00)	68.36 ** (32.76)	69.76 ** (33.48)
Output gap	0.50 ** (13.05)	0.52 ** (13.47)	0.49 ** (12.90)	0.50 ** (13.33)	0.47 ** (12.86)
Public employment rate	0.93 ** (8.01)	0.78 ** (6.29)	1.01 ** (8.64)	0.86 ** (6.97)	1.03 ** (9.15)
Tax wedge	-0.03 (-0.90)	-0.01 (-0.17)	-0.14 ** (-2.95)	-0.12 * (-2.52)	-0.16 ** (-3.52)
Union density	-0.22 ** (-11.38)	-0.22 ** (-11.30)	-0.20 ** (-9.29)	-0.19 ** (-9.18)	-0.20 ** (-9.20)
High corporatism	0.68 (1.48)	0.66 (1.41)	0.78 (1.70)	0.71 (1.54)	0.27 (0.59)
Medium corporatism	-0.83 (-1.86)	-0.60 (-1.34)	-0.32 (-0.68)	-0.04 (-0.09)	-0.68 (-1.51)
Unemployment benefit	-0.07 * (-2.41)	-0.05 (-1.58)	-0.06 * (-2.10)	-0.04 (-1.47)	-0.06 * (-2.33)
EPL*low corp		-0.93 (-0.68)		-0.85 (-0.64)	
EPL*medium corp		-4.08 ** (-5.89)		-3.26 ** (-4.55)	
EPL*high corp		-1.13 * (-2.11)		0.06 (0.10)	
EPL	-2.22 ** (-5.42)		-1.33 ** (-2.80)		-1.92 ** (-4.12)
Regulation			-0.70 ** (-3.56)	-0.76 ** (-3.86)	
Regulation*low corp					-2.25 ** (-6.84)
Regulation*medium corp					-0.52 * (-2.13)
Regulation*high corp					-0.16 (-0.68)
Fixed effects (F-statistic)	196	172	68.8	59.7	65.9
Observations	335	335	335	335	335
Countries	20	20	20	20	20

Note: t-statistics are in brackets. *,** denote significance at 5% and 1% respectively

Figure 7: Labor and Product market determinants of the non-agricultural employment rate, 1982-1998

Source: Ibidem. Page 49

4.2 Product Market Regulation and Unemployment

The current study differs with respect to the ones presented above, because it focuses on the relationship between product market regulations and unemployment (not employment) over time. We decided to use unemployment rates because many social/cultural variables other than economic conditions affect employment rates. By using unemployment data, in fact, we are able to avoid some “social” control variables that, because non quantitative, are very hard to find and use in this sort of studies. On the other hand we lose a bit in precision, because changes in unemployment rates might be dictated by factors other than the change in the number of employed individuals, like a decrease (increase) in the number of people actively looking for a job. The autocorrelation affecting time-series data has been eliminated first by including fixed effects in the regression (within transformation) and secondly by using the absolute changes of the variables at hand instead of their nominal values (first differencing approach).

4.2.1 The Data and the Model

The data collected comprised unemployment data for the time period 1978-1998. Unluckily it was impossible to find a complete database. For this reason, the OECD database has been used as a base and it has been integrated with the ESDS database for the years missing. The data regarding product market regulation were taken from Nicoletti et al.²¹ (2001). Unfortunately product market regulation assessments are not very frequent. The authors estimate them in intervals of 4-5 years for two main reasons. Firstly, the assessment is a very long and cumbersome procedure; secondly, the changes between one year and another are very small and negligible. The problem for the econometric study at hand is that even if the period considered is relatively long (20 years), the observations per country are only 5. The countries for which the data are available are 21, so we have a total of 105 data points when using nominal values and 84 when using the absolute changes (we lose the first year). The number of observations are relatively low for a panel data and this is surely one important source of concern.

The econometric study will first just estimate the relationship between unemployment (dependent variable) and product market regulation (explanatory variable). Then time-specific effects will be added. The final step will be to include country-specific effects too. Before describing the regression results, it is due to highlight some important elements that determined the choice of the specific models used.

Given that we use fixed and not random effects, we cannot use any control variable that is not country-specific, because it would be reflected only in the constant. This rules out the usage of many common and powerful control variables like “oil price” or “world economic growth”. Given the very strong correlation between labor and product market institutions (explicitly shown in the next section)²², we know that by adding the first as control variable, we lose some of explanatory power of the latter. Furthermore it was not

²¹ Nicoletti, Giuseppe, Andrea Bassanini, Ekkehard Ernst, Sébastien Jean, Paulo Santiago and Paul Swa, 2001. “Product and labour markets interactions in OECD countries,” OECD Economics Department Working Papers 312, OECD Economics Department. Page 45

²² Please refer to paragraph 4.3

possible to obtain data regarding “Labor Markets Regulations” for the same years as the ones for “Product Market Regulations”.

4.2.2 Regression Results

The results for the first specification

$$U_{kt} = \alpha_0 + \alpha_1 REG_{kt} + \varepsilon_{kt} \quad (3.4)$$

indicate a positive and very significant correlation between regulatory levels and unemployment, but the Durbin-Watson test highlights a strong positive autocorrelation of the error terms, which makes us reject the validity of the results obtained.

The second specification

$$U_{kt} = \alpha_0 + \alpha_1 REG_{kt} + \sum_t DT_t + \varepsilon_{kt} \quad (3.5)$$

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.667160	1.274829	3.661008	0.0004
Regulatory level	0.562024	0.292980	1.918301	0.0580
Fixed Effects (Period)				
1—C	-2.329904	3—C	-0.459633	
2—C	-0.790941	4—C	2.363814	
		5—C	1.216664	
Effects Specification				
Period fixed (dummy variables)				
R-squared	0.136510	F-statistic		3.130209
Adjusted R-squared	0.092900	Prob(F-statistic)		0.011501
Durbin-Watson stat	0.453104			

Figure 8: Panel data results. Unemployment against product market regulation and period fixed effects.

indicates an almost 5% significance of the product market explanatory variable. Although the relationship is relatively strong, we observe that the Durbin-Watson test still highlights a serial autocorrelation of the error terms. For this reason we are not able to claim that product market regulation affects unemployment rates.

Finally, the third specification

$$U_{kt} = \alpha_0 + \alpha_1 \Delta U_{kt} + \sum_k \beta_k DC_k + \sum_t DT_t + \varepsilon_{kt} \quad (3.6)$$

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.907546	2.358383	2.504914	0.0143
Regulatory level	0.272986	0.547601	0.498513	0.6195
Effects Specification				
Cross-section fixed (dummy variables)				
Period fixed (dummy variables)				
R-squared	0.773787	F-statistic	10.80914	
Adjusted R-squared	0.702201	Prob(F-statistic)	0.000000	
Durbin-Watson stat	1.726629			

Figure 9: Panel data results. Unemployment against product market regulation, period fixed effects & country fixed effects.

highlights the insignificance of the “product market regulation” coefficient. This result indicates its strong correlation with other country specific variables like GDP, but also unemployment benefits, labor market regulation, EPL etc... Furthermore, now the Durbin-Watson test indicates no autocorrelation and this makes us believe that indeed the significant relationship between unemployment and product market regulation found before was spurious or, in any case, very hard to isolate.

When we repeat the same procedure using not the nominal values, but the changes over time of both unemployment and product markets regulation (not reported), we were not able to obtain a significant coefficient for the explanatory variable under any model specification, while the Durbin-Watson tests showed at all times that the error terms were not autocorrelated.

The results show that it is very hard to prove the relationship between employment and product market regulation. Although theoretically the relationship appears to be clear and precise, it cannot be claimed to be contained in the data at hand.

The disappointing results can be due to a number of reasons. First of all, in this kind of studies one of the variables is made out of quantitative data, the other is an index based on the aggregation of hard and soft, qualitative and quantitative data. As a consequence the index for “Product Market Regulation” used might not be precise enough to be econometrically significant.

Another source of concern is given by the fact that “Product Markets Regulation” was estimated at 4-5 years intervals. This did not allow for the use of any lags in the explanatory variables. The fact that only 5 data points for each nation were available increases further the difficulty in obtaining a significant relationship between the variables at hand.

Finally, product market regulation is correlated (multi-collinear) to many other economic and institutional indicators. This makes it very hard to prove its significance once used next to other control variables or Country & Time-Specific Effects.

4.2.3 Concluding Remarks

As a whole, we were not able to fully support empirically the theoretical developments of the model presented by Blanchard and Giavazzi. Out of the two studies presented, only the one by Nicoletti et al. (2001) showed a significant relationship between the variables at hand. Their approach, but, is not very well explained and some further analysis would be required. The findings by Boeri et al. are not able to prove any significant relationship between “Product Market Regulation” and “Employment”. Finally, the independent study conducted in this paper was not able to move any step further, highlighting that most of the effect of the first on the latter is spurious, or in any case very hard to isolate from that of other control variables. Most likely, as highlighted by Boeri et al. the reason stands in the very high correlation between product and labor market regulations, which is briefly analyzed below.

4.3 Correlation between Product and Labor Markets Regulation

The correlation between the two variables is very important in this context as highlighted above. Unfortunately, due to the aforementioned lack of data, we are not able to conduct a study on the correlation of product and labor market institutions over time. A study demonstrating the direction of causality between the two is impossible for the same reason. Following the example of Nicoletti, Scarpetta and Boylaud²³ we report below the bi-variate correlation between product and labor market regulations in 1998 for 21 OECD countries. Given the non-existence of indices representing the overall level of labor market regulation, following Boeri et al. and Nicoletti et al. (2000) we have decided to proxy it through the degree of EPL. The relationship is represented in the scatterplot below.

The correlation coefficient “ ρ ” is 0,658387, which demonstrates a relatively strong bi-variate correlation. The relationship shown below has two very important implications:

- 1) First, it proves that the insignificant relationship between Product Market Regulation and Unemployment/Employment can be attributed not only to a lack of explanatory power of the first on the latter, but to multi-collinearity with labor market regulation.
- 2) Secondly, Figure 10 empirically validates one of the main findings that Blanchard and Giavazzi²⁴ developed theoretically: i.e. that a decrease in product market regulation naturally leads to (causes) a decrease in labor market regulation. The theoretical framework, but, is only partially demonstrated. In fact, we are not able to show the direction of causality entailed by the model, but only the fact the two variables move together.

²³ Nicoletti, Giuseppe, Stefano Scarpetta, and Olivier Boylaud, 2000. “Summary indicators of product market regulation with an extension to employment protection legislation”, Economics Department Working Paper 226, OECD.

²⁴ This section refers to Blanchard, Olivier and Francesco Giavazzi, 2003. “Macroeconomic effects of regulation and deregulation in goods and labor markets”, Quarterly Journal of Economics, 118(3): 879{909}.

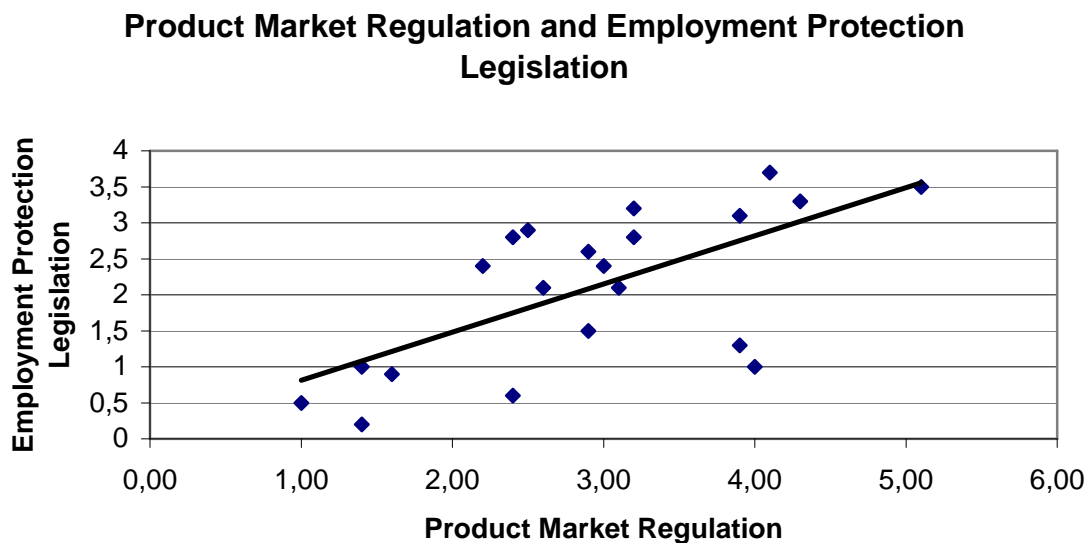


Figure 10: Product Market Regulation and Employment Protection Legislation. 1998

The final section of this empirical chapter is dedicated to probably the most important relationship that policy-makers care about, i.e. the one between product and labor market regulation and economic growth.

5 Product & Labor Markets Regulation and Economic Growth

Unfortunately, there is a serious lack of data concerning the assessment of product and labor market regulation. It was not possible to find any database that contained both measures for a sufficient number of years. As explained above, product market regulation has been analytically assessed from 1978 until 1998 at intervals of 4-5 years by Nicoletti et al. (2001). On the other hand Labor Market Regulation or any of its components (EPL, minimum wages, unemployment benefits) were never assessed in an organic way for a sufficient number of years. For this reason, we were not able to find a single research paper that related economic growth to the two variables at hand. The closer the literature has gone to this topic is the paper by Nicoletti and Scarpetta (2003)²⁵, where the authors study the relationship between product market regulation and productivity growth.

The paper proves that productivity is increased by reforms promoting private governance and competition. Both privatization and entry liberalization are estimated to have a positive impact on productivity in all sectors. In manufacturing the second is particularly influential, because regulation limiting entry hinders the adoption of existing technologies, possibly by reducing competitive pressures, technology spillovers and the entry of new high-tech firms. The authors take these findings as a powerful interpretation of the observed recent differences in growth patterns across OECD countries, in

²⁵ Nicoletti, Giuseppe and Stefano Scarpetta, 2003. "Regulation, productivity, and growth: OECD evidence," Policy Research Working Paper Series 2944, The World Bank.

particular between large Continental European economies and the United States. Strict product market regulations—and lack of regulatory reforms—are likely to underlie the relatively poorer productivity performance of some European countries, especially in those industries where Europe has accumulated a technology gap (e.g. ICT-related industries).

These insights are certainly powerful and in line with Aghion and Acemoglu’s findings presented in section 1.1, but two elements leave us dissatisfied with the study at hand. First, it focuses on productivity growth and not GDP per capita growth: although very close to each other, the two variables are not always equal and, for our purpose, a study using GDP per capita growth would be preferable. Secondly, it does not show the effects of labor market regulation on economic growth.

To achieve a better understanding of the subject at hand, we present here two studies. The first is a cross-section analysis where we regress GDP per capita against the levels of product and labor market regulation in 2003. The second study is a bit less straightforward: we take the IMD “Competitiveness Index” as a proxy for product and labor market regulation and we conduct a panel data study trying to determine if changes in the regulatory environment determine differences in “GDP per capita” growth figures.

5.1 Product and Labor Markets regulation and GDP per Capita²⁶

Given the aforementioned lack of data, we have decided to run a cross-section study for the year 2003. We regress nominal GDP per capita against indicators of product and labor market regulation for 28 OECD countries according to different model specifications. As presented in section 3.4.3, the two sectors tend to have similar regulatory levels across countries. This results in a strong multi-collinearity. In order to overcome this problem, we tried to use different proxies for product and labor market regulation. For the first we used alternatively the aggregate indicator of product market regulation developed by Nicoletti et al. (2000), “state control”, “barriers to entrepreneurship” and “barriers to trade and investments”; for the second we used alternatively the degree of “EPL”, “strictness on individual dismissals” and “collective bargaining coverage”. Unfortunately our efforts to exclude multi-collinearity did not lead to any valuable result. The level of Labor Market Regulation is significantly negatively correlated to the level of GDP per capita when used alone in the regression equation. It is instead insignificant when inserted along Product Market Regulation and vice-versa. We certainly cannot be satisfied by these results, but the high correlation between the variables at hand makes it impossible to estimate their individual effect on GDP per capita levels.

To understand the effects of product and labor market regulation we now adopt a different strategy. We use a nation’s competitiveness level, as assessed by the IMD, as an instrumental variable for both product and labor market regulation.

²⁶ For space reason we only briefly report the findings obtained.

5.2 Competitiveness and Economic Growth

5.2.1 The IMD Competitiveness Index

As a first step, it is fundamental to describe the methodology used by IMD in building the “Competitiveness Index”. The annual competitiveness rankings are composed of four sub-categories: economic performance, government efficiency, business efficiency and infrastructure. For these sub-categories there are 83, 77, 69 and 94 individual criteria, respectively. The categories themselves are further broken down for a total of twenty sub-factors.

Each of the twenty sub-factors receives an equal weight of 5%, irrespective of the number of criteria composing it. To give each of these elements a score, the IMD uses hard and soft data. The former receives a weight of two thirds and the latter accounts for the rest. The soft data originates from the so-called annual executive opinion survey. The survey is an in-depth 112-point questionnaire sent to business executives and economic experts.

5.2.2 The Model

The empirical model to be proposed analyses the statistical relationships between the national economic performances and the composite IMD competitiveness index. A panel data model is used. Data were collected for 46 different countries, which include industrialized, developing and least developed countries. A list of the countries is given in Figure 11 below. In the analysis we use the entire set of countries. However, we also conducted our analysis separating the sample into industrialized and developing countries. Our findings were unaffected and therefore not reported here.²⁷

The IMD index was taken for ten consecutive years (1995-2004). Because the overall IMD index is an aggregation of separate, but complementary sub-components (i.e. Economic Factors, Government Efficiency, Business Efficiency, Infrastructures), it was our intention to analyze their individual effect on economic welfare and identify which would be the most important factor in driving economic growth. This analysis was not possible because the building blocks of the overall index have changed over time. It was possible to have consistent sub-indices only for the years (2000-2004), which was considered too little of a time span.

Australia	Finland	Israel	Philippines	Taiwan
Austria	France	Italy	Poland	Thailand
Belgium	Germany	Japan	Portugal	Turkey
Brazil	Greece	Korea	Russia	United Kingdom
Canada	Hong Kong	Luxembourg	Singapore	USA
Chile	Hungary	Malaysia	South Africa	Venezuela
China Mainland	Iceland	Mexico	Spain	
Colombia	India	Netherlands	Sweden	
Czech Republic	Indonesia	New Zealand	Switzerland	

Figure 11: List of countries included in the panel data regression.

²⁷ The results are available from the authors upon request.

“GDP per capita growth” was used as independent variable, The Penn World Table database was used for the period 1950-2000. IMF data were used to integrate the successive four years. The business cycle is stripped out of the real GDP per capita growth data by using the Hodrick-Prescott filter. This is done to obtain the structural growth rates, which serve as a proxy for potential economic growth of the countries in question. To have a ‘clean’ measure of it, the real growth rate data is smoothed over the period 1950-2004, even though the index data is limited to the period 1996-2004. Thus, only the part of the smoothed data, which lies within the period 1995-2004, is used..

The independent variable is the “change in the absolute competitive rank from one year to the next”. The changes are calculated in such a way, that an improvement in rank (i.e. a change in rank from 14 to 12) is represented by a positive number (i.e. +2). Thus, we expect to have a positive coefficient for the changes in ranks. Further on, we included lags of the changes in rankings. More precisely, they have been lagged by one, two and three periods. Simply, an improvement or decrease of competitiveness might not show up immediately in the data. It might need time to manifest itself. Country-specific and time-specific fixed effects were used.

5.2.3 Regression Results and Concluding Remarks

Here is the model specification adopted:

$$\Delta GDP_{it} = \alpha + \beta_1 \Delta INDEX_{it} + \beta_2 \Delta INDEX_{it-1} + \beta_3 \Delta INDEX_{it-2} + \beta_4 \Delta INDEX_{it-3} + \varepsilon_{it} \quad (3.7)$$

Where ΔGDP is the real growth rate per capita adjusted by the Hodrick-Prescott Filter $\Delta INDEX$ is the change in competitiveness ranking, constructed as explained above and $\Delta INDEX_XLAG$ is the index change lagged by X periods.

In Figure 12 below are reported the estimation results. The coefficient for $\Delta INDEX$ is significant up to the second lag, indicating a strong relationship between the ranking in the IMD competitiveness index and economic growth. Although the proxy used did not contain product and labor market regulation only, with this study we have shown the close relationship between economic growth and the friendliness of the regulatory environment. We have tried to use separate proxies for product and labor market regulation to show their independent effects on economic growth, but either they were not available for a sufficient time-span and number of countries or they were so imprecise to result insignificant.

To conclude, the results of this study should be taken only as preliminary. Future research attempts should be aimed at showing the independent effects of product and labor market regulation on economic growth across countries over time. It is important to have an empirical quantification of the two to better direct future policy-making and enact reforms to maximize structural growth.

Dependent Variable: GDP per capita Growth adjusted by the Hodrick-Prescott filter
Total pool (balanced) observations: 276

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	2.741264	0.030920	88.65790	0.0000
Δ INDEX	0.036429	0.010445	3.487617	0.0006
Δ INDEX_1LAG	0.032011	0.010419	3.072315	0.0024
Δ INDEX_2LAG	0.023600	0.010309	2.289319	0.0230
Δ INDEX_3LAG	0.014842	0.010291	1.442304	0.1506
Fixed Effects (Country-specific)				
Fixed Effects (time-specific)				
R-squared	0.918993	F-statistic	46.42904	
Adjusted R-squared	0.899200	Prob(F-statistic)	0.000000	
Durbin-Watson stat	1.677949			

Figure 12: Panel data regression relating “GDP per capita” growth figures adjusted by the Hodrick-Prescott Filter to yearly changes in the IMD Competitiveness Ranking, country-specific and time-specific fixed effects.

6 Summary and Conclusions

The paper was meant at deepening the reader’s understanding of the relationship between economic growth and product/labor market regulation. Although most of the economists believe in the positive effects of deregulation, the empirical estimations did not always prove to be completely satisfactory. In this context, the paper analyzes and supplement previous results for a better understanding of the subject at hand.

In particular, we have moved some steps forward in showing that the relationship between unemployment and productivity growth is positive only in the short-run while it becomes closer and closer to zero the longer the time-span under consideration.

After commenting and analyzing the results obtained by Boeri et al. and Nicoletti et al., we have provided an independent estimation of the relationship between employment and product market regulation. Although disappointing, it has helped creating a better understanding of the problems related to the estimation of these types of relationships.

Finally, the last section of the paper was dedicated to proving the relationship between regulation and economic growth. The approach has been a little unconventional, given that we have used the IMD competitiveness index as a proxy for the regulatory friendliness of a given country. The results, have appeared to be very promising and we hope that future research with more precise data and sharper estimation techniques might be possible in the future.

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